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GEOLOGIC AND MINERAL AND WATER RESOURCES INVESTIGATIONS

IN WESTERN COLORADO, USING SKYLAB EREP DATA

Monthly Progress Report

March 1974

EREP Investigation 380

Contract NAS-13394

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Submitted to:

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INTRODUCTION

The primary objective of the CSM Skylab Program is to analyze EREP data for geologic information. To this end, the research has been subdivided into the following tasks;

- Task I. The PI shall assist NASA/MSC in mission planning activities related to the proposed investigation.
- Task II. The investigator will screen all EREP data obtained over Colorado and will select frames for detailed study.
- Task III. The investigator will prepare photogeologic maps using selected S-190 photographs, and will analyze them to determine what geologic information may be contained in them.
- Task IV. The geological interpretations obtained in Task 3 will be compared to interpretations obtained from S-192 imagery, and to interpretations made from ERTS-I imagery.
- Task V. The geological interpretations will be verified by means of interpretation of aerial photographs, published geological reports, and field observations.
- Task VI. The investigator will prepare recommendations for the optimum type, scale, and resolution of imagery to be used for studies of regional geology and exploration for mineral deposits and water resources.

PROGRESS

Overall Status

With this report, Milestones 1 through 15 have been achieved, with the exception of Milestone 14 - Screening and Indexing of SL4 data; these data have not been received.

Past Month's Activities

Activity during March included the application of geologic photointerpretation to the Bonanza Test Site, in an attempt to (a) fill in some of the gaps remaining after the compilation of existing geologic mapping, and (b) resolve some of the conflicts between join-lines of existing geologic maps. Current photogeologic interpretation is being done with SL2 photos; receipt of SL3 enlargements is anticipated soon. Preliminary results of this work will be summarized in the April report.

Skylab 4 data were reviewed at JSC to provide a fairly complete picture of data acquired on all three SL missions. More data were acquired over Colorado on SL4 than had been recorded on the Post-pass telecorder messages.

The semi-quantitative evaluation of the ability to discriminate rocks on high-altitude aircraft color photos, ERTS images and Skylab/EREP S-190A and S-190B photos continued during March. Evaluation of the discriminability of 24 lithologic contacts on ERTS images was completed; these same contacts will now be evaluated on Skylab/EREP photos and the results of the ERTS and Skylab evaluations will be statistically compared.

Computer processing of fracture orientation data continued with analysis of the Pikes Peak intrusive center joint measurements. Preliminary correlation of the joint trends over large areas with linear trends in images is not good. Comparisons will be made for smaller areas, as the relationship may be localized to small areas.

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Evaluation of the recognition of geologic structures on Skylab photography continued with interpretation of SL2 and SL3 multiband, color, and CIR. Clouds conceal much of the Front Range test site but previously unknown linears were discovered that can be related to major faults known on large scale photography and geologic maps. SL4 photography is being awaited for completion of the evaluation.

An attempt was made to locate alteration-caused color anomalies using Diazo color-coded density slicing methods. Results were inconsistent, due to changes in surface reflectance as the geometrical relationship between illumination source (sun), surface, and camera changed. No color anomalies were found, nor was it possible to correlate similar surface features (lithologic units, water bodies, vegetation types) over large distances. The Diazo process as used here may prove helpful in correlation problems in local, uniform areas.

Considerable effort was expended in March toward completion of two technical papers that were presented at the 3rd Annual Remote Sensing of Earth Resources Conference, 25-26 March 1974. The papers were "Geologic Information from Space Images" by Keenan Lee, D.H. Knepper and D.L. Sawatzky, and "New Uses of Shadow Enhancement" by Don L. Sawatzky and K. Lee.

Planned Activities for Current Month

Research during April will be concentrated largely on summarizing our technical progress to date.

By separate letter we are requesting (a) enlarged photo prints for annotation bases and (b) SL92 interpretation imagery defined on screening film.

Travel

Travel during March consisted of one man-trip to the University of Tennessee Space Institute for presentation of a paper, one man-trip to JSC/Houston for screening of SL4 data, and one man-trip to Leadville-Cripple Creek for field checking.

No travel is anticipated in April.

Outlook and Recommendations

Progress continues to be satisfactory, although still behind schedule because of our late start and delays in data receipt. A no-cost time extension of six months is requested, permitting the research to continue through 30 June 1975.

A handwritten signature in black ink, appearing to be 'Keenan Lee', written in a cursive style.

Keenan Lee
Principal Investigator